Cold tolerance of rice plants transformed with *Arabidopsis* H+/Ca^{2+} antiporter *CAX*1 gene

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Objectives

This study was carried out to evaluate the cold tolerance for the rice plants expressed *CAX*1 (accession no U57411) gene.

Materials and Methods

o. Plant materials: 7-day-old seedlings of T_3 lines

o. Cold treatment condition : 14 days at 17℃.

o Analysis of chlorophyll content · leaf of transgenic plants treated for 14 days at 17℃

Results and Discussion

In the previous study, we successfully developed the transgenic rice plants overexpressing the *Arabidopsis* H^+/Ca^{2+} antiporter *CAX*1 gene. The 7-day old seedlings of transformants were treated for 14 days in growth chamber controlled 17℃. Cold tolerance of transgenic plants were compared with the donor rice cultivar, 'Ilpumbyeo'. Most of transgenic plants appered to have cold tolerance compared with wild types. The chlorophyll content of T_3 transfomants was higher than that of wild type The gene of *A. thaliana* H^+/Ca^{2+} transporters, *CAX*1 provides resistance to abiotic stresses in most crops(Hirschi et al. 1996).

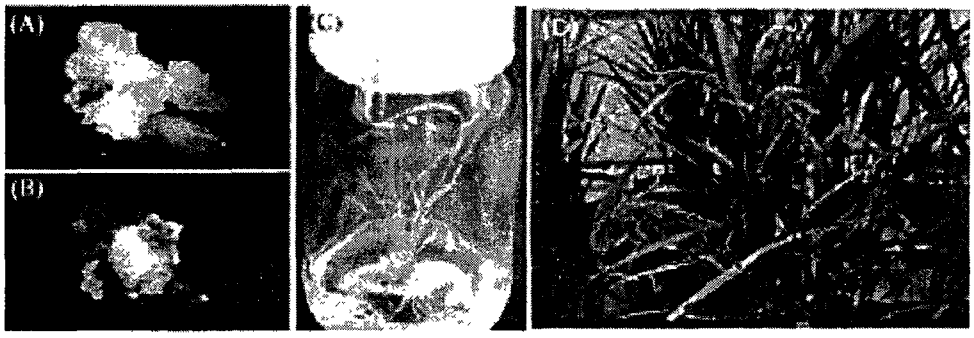

Fig. 1 Development of calcium-rich rice. (A) induction of seed-derived callus on modified N6 medium, (B) green spot on co-cultivation of rice callus which *Agrobacterium* vector (pCAX1), (C) plant regeneration from callus, (D) ripening stage of the transgenic plants.

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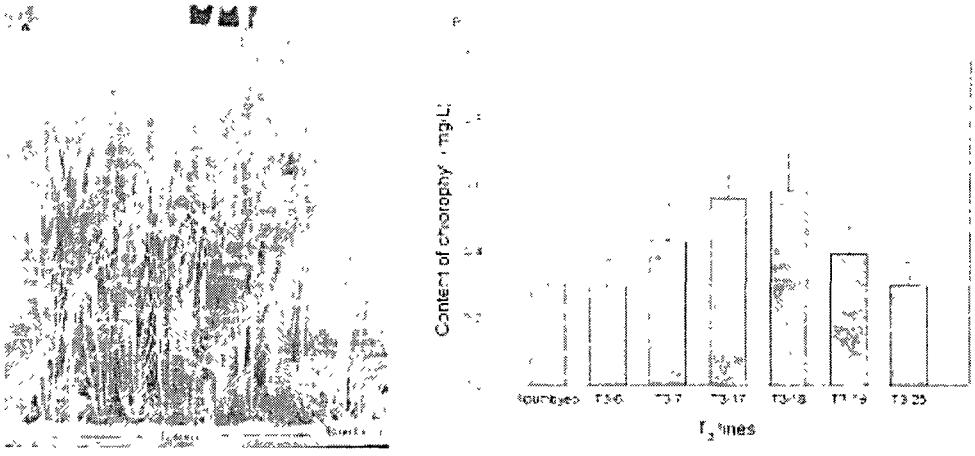

Fig. 2. Cold tolerance of T_3 plants treated for 14 days at 17℃. A: Phenotype compared with wild type plant and transformants, B: Chlorophyll content compared with wild type plant and transformants.

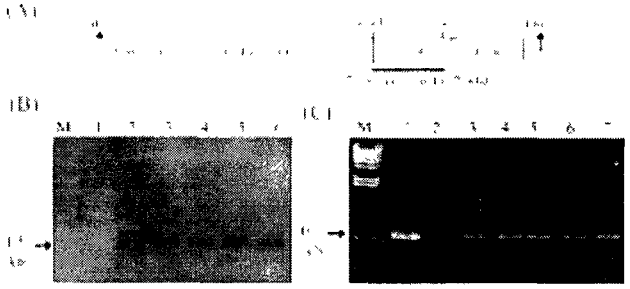

Fig. 3 DNA gel-blot analysis. (A) Schematic diagram of part of the T-DNA region of vector pCAX1. Nos-pro, promoter of nopaline synthase gene; NPT II, neomycin phosphotransferase II gene; Nos-ter, terminator of nopaline synthase gene; 35S pro, CaMV 35s promoter, (B) Southern blotting hybridization pattern of DNA prepared from T1 transformed plants and an untransformed plant. Genomic DNA was digested with *Xba* I and *Sal* I fractionated on 0.8 % agarose gels, and transferred to nylon membranes. The membrane was hybridized with 32P-labeled fragment of *CAX*1 probed. M; λ/*Hind* III digested marker, 1; control plant, 2~6, transgenic plants, (C) PCR analysis of genomic DNA from control and T0 rice leaf tissues. PCR products amplified from putatively transformed tissues were visualized by electrophoresis on a 0.8 % agarose gel stained with ethidium bromide. M; λ/*Hind* III digested marker, 1; pCAX1 vector, 2; untransformed plant, 3~7: transformed plants.

References

Hirschi KD, Zhen RG, Cunningham KW, Rea PA, Fink GR. 1996. CAX1, an H^+/Ca^{2+} antiporter from *Arabidopsis*. Proc Natl Acad Sci USA 93:8782-8786.